BOEM DEEPWATER GULF OF MEXICO HISTORY PROJECT

OFFSHORE ENERGY CENTER HALL OF FAME

Interviewee:	Hank Van Calcar
Date:	October 10, 2009
Place:	Houston, Texas
Interviewer:	Tyler Priest
Ethnographic preface:	Hank Van Calcar grew up on a ranch in Oregon, and attended Oregon State University to study power engineering. With an additional master's degree from OSU in hand by 1959, Van Calcar worked on control and feedback systems for TRW Systems. After several years, Van Calcar relocated to Seattle to work for Honeywell, where he became involved in building dynamically-positioned ships for the offshore drilling contractor SEDCO. Over his long career, Van Calcar worked on the landmark Shell Cognac fixed platform, as well as on the Exxon first-of-its-kind Lena guyed or compliant tower. Van Calcar retired from Honeywell in 1992.

File 1

TP: This is an interview with Mr. Hank Van Calcar for the Offshore Energy Center Hall of Fame induction in 2009. Congratulations. The interviewer is Tyler Priest. We're in Houston, Texas, and it's October 10, 2009.

Let's start off with some background. Where are you from, where did you go to school, and how did you train yourself to get involved in this whole line of work?

HV: I started off at Oregon State University as an undergraduate in power engineering.

TP: How did you end up at Oregon State?

HV: Well, I was an Oregonian. I was raised in Coos Bay, Oregon, on a dairy ranch. Cows never took a day off, so I finally decided there was an easier to make a living, and I became an engineer. My first job was at Caterpillar Tractor Company, where I learned analog simulation work. I was so fascinated with the feedback control stuff that after my two years in the military, I went back to graduate school.

TP: At Oregon State?

HV: Yes, at Oregon State.

TP: What year would this have been?

HV: Undergraduate would have been '57, and then in '59 for graduate school, and that was primarily to learn control system theory. From there, I went to Space Technology Laboratories, where I built and designed the control systems for ballistic missiles and spacecraft, and that's the technology that basically we used later on for building dynamic positioning systems. So it was a perfect background.

TP: What was the company you were with when you did this?

HV: This was Space Technology Laboratories, which changed its name six times during the six years I was there. When I left, it was TRW Systems, and it's still TRW Systems.

TP: It's interesting, because looking at the offshore industry, there are a lot of crossover applications with the space program, with the military program. So when you're looking at these very advanced technologies that's the same kind of control systems for ballistic missiles you would need.

HV: Basically, once you get into the control system theory, you start writing all the dynamic equations for the thing you're going to control, and then you design a control system to do what you want that particular system to do. And so the technology and what I learned in building the control systems for ballistic missiles in spacecraft were identical to what we did on the *SEDCO 445*, which was the first DP system for deepwater offshore drilling.

TP: Tell us about your involvement with the *SEDCO 445*. Is that where you went next, after the Space Technology Systems?

HV: Yes, after I left L.A. Because I wasn't about to raise my kids in the Los Angeles environment when I had been raised in the woods of Oregon. So a good friend of mine, he always said, "When you get ready to leave L.A., you give Honeywell first choice at you."

So, after a particular program, I decided it was time to leave. I sent him my résumé, and about a month or two later, I was at Honeywell in Seattle. I'd been there about a year and a half when SEDCO came over and decided they wanted to build a DP system. Nobody built DP systems at that time for drilling vessels. Howard Shatto had built them for, I think it's the *Eureka*, and there were several others.

TP: Drill ships?

HV: Yes, for ships. I think the *Glomar Challenger* also preceded it, and there were a couple others, but this was the first time for a drill vessel.

TP: Like a semi-submersible?

HV: No, this was a ship. The *SEDCO 445* was 445 feet long. That's how it got its name, *SEDCO 445*. And it had eleven thwart ship thrusters and two main screws. The difficulty with that particular system was that to reverse the thrusters, they used SCRs to build the—they were DC traction motors. And to reverse them, they had to collapse the armature current, then reverse the field current, then build up the armature current again. That way they only had to use one set of SCRs for the generator. And to reverse the thruster, it had six and a half seconds to make the transitions, so now you've got to build the control systems with a dead zone in there with a time of six and a half seconds every time it goes through zero thrust. That was a bit of a challenge.

When I first started, not having ever built a ship before, after writing the equations of motion for the ship, I simulated it on an analog computer, and

what I learned is why they sail a ship pointy end first, and that was about it. It turns out that the thwart ship, the fore aft, thwart ship and heading control while you're on station are totally uncoupled. It's like having three independent control systems; one for foreaft, one for thwart ship, and one for heading.

TP: Thwart ship, you're saying?

HV: That's sideways. So that whole process made it a whole lot simpler because the control systems are basically uncoupled, and you didn't really have to worry about the cross-coupling that you get out of some types of control systems. It took about fourteen months from the time we started until we were in Japan to do the sea trials.

TP: Give me a time frame here. When did you start working on this?

HV: Pretty close to 1970, somewhere in that range. We got everything pretty well checked out when we were first got there, but the Baylor Company was having a really tough time getting the thrusters to work completely all the way through and do the reversals. Finally, after much work, they had one thruster that worked, and it worked all the way through perfectly. Dillard Hammett came into the control room, where they had the DP system, and asked, he says, "Well," he says, "what can you do with one thruster?"

And I said, "Well, not much."

He says, "Will it hold heading?"

I says, "Well, it should."

He said, "Let's try it." So we put that one thruster online, and—

TP: Was the *SEDCO 445* under contract with Shell at this time?

HV: Yes, it was built for Shell. So we put in a five-degree heading change, and that thruster went "shhhhh." We both looked out the window and the boat was turning, and when it got to 5 degrees, the thruster stopped the turning and it stopped. And Dillard said, "Well, I'll be damned." He said, "It worked."

And I said, "What do you think, Dillard? It's supposed to work." [laughs].

And then because they couldn't do the sea trials, we came back, and two weeks later all the thrusters were working, and we went to the sea trials and it worked very well.

TP: You said this is the first DP system built for a drill ship?

HV: Yes, for a drill ship.

TP: But they had used it on the *Cuss* and the *Glomar Challenger*?

HV: One was a coring vessel. This was the first one for doing drilling. They had the BOP and the risers for it; pipe handling and whole thing.

TP: So the sea trials were off Japan, you said?

HV: Yes, it was built in Tamano, Japan.

TP: So you finished that project right after you outfitted the vessel?

HV: I came back with that, and immediately went into the *Glomar Explorer* program.

TP: Tell us about that.

HV: Not much we can tell you about that, really. But I went out. I was actually out on the mission.

TP: Did you work with Curtis Crook [phonetic]?

HV: Yes. I built the trainer for the system so we could train the crew. That was the most interesting project because the whole control system, everything worked. You could not tell the difference between working the mission and working the actual operation, because we simulated everything that was possible for the machine. So we could practice the whole control system, the whole operation. And it quite annoyed me that the people that were working on it, they all said, "Oh, my goodness, we don't like this trainer." Sweat balls were coming off their foreheads. By the time they got ready to do the mission, they were all trained, with confidence, and they did the mission. So that was very exciting.

TP: Were you working on the control systems and the simulator?

HV: The simulator was just like a flight trainer for an airplane. Right now you fly an airplane, and the first time you fly your airplane, once you've been

trained on the simulator, you got a full load of passengers behind you. It's the same technology.

When we did the *SEDCO 445*, we also did a closed-loop control where we used the analog computer to simulate the ship, and as far as the DP system that we put on board the ship, it didn't know that for the last four months it had not been operating the ship, because it couldn't tell the difference between an operating ship and working with the simulated computer.

As soon as I got done with that, that's when Shell came over for the Cognac project, and the Cognac project essentially looked at the whole system, everything that was required to do that three-stage installation.

TP: Yes, because Honeywell developed all the acoustic transponders, right?

HV: All the acoustic transponders were built by Honeywell.

TP: Were you involved in that part of it?

HV: Oh yes. In fact, I was very much involved in the development of the acoustic systems that we used on there. That's the same acoustic systems that I helped develop while I was at Honeywell. And then we also built a trainer for the Cognac project, the same way we did for the HG, where everybody in the control center couldn't tell the difference between lowering that first base section versus doing it on a simulator. Basically like another flight trainer.

I can remember the first time we ran through with the whole group, we had just run through the initial lowering, ballasting the thing down until it went under water and was all ready to be lowered. It would take two hours for it to get down to the bottom at the rate that you lowered it, because it was a very slow process. And I can't remember if it was Gordon Sterling or Norris Dodge who said, "Well, is there a way we can now speed this up so we don't have to take the two hours to get it down to the bottom?"

And I said, "Well, yes, we probably could, but I was planning to do two contingency trainings, operations on the way down."

He said, "Well, okay."

And we started that thing down. I had made up a couple of contingencies, and I took my engineer over there and I said, "When I give you the nod, you just put in this contingency where we fail a sensor," or fail a valve or do something. And that place turned into absolute total chaos. The

engineers from Shell and from Houston Systems and whoever else was in there lowering that system, they found out that they didn't have a clue how to lower this thing and how to handle contingencies, and they didn't understand the limitations on the instrumentation.

I remember it was Gordon Sterling who said, "Okay, this session is over. We're going home. We'll come back in a week after we understand what it is we built, and then we'll have another training session [unclear]."

TP: This was when you were doing the simulation?

HV: That was the simulation. It's like a flight trainer.

TP: So you were testing for various things that could go wrong.

HV: Yes, for various things that could go wrong. So you put in these failures, the way you respond to the failure is exactly the way the main system would respond if you had a failure. These trainers are worth their weight in gold. It was amazing. When they got through, they were ready.

TP: So they had to go back and plan for all these various contingencies?

HV: Yes.

TP: How long did that take for them to do?

HV: Oh, they came back in a week. They pretty well had it sorted out, and then they still made a lot of mistakes, but now all of a sudden they knew the system and all that. I can remember we always said that the xyz, x is forward, y is up, and z is down. Then you got the right-hand rule, this is positive roll, this is positive heading, and this is positive pitch. So one of the guys came in with this hat, and on it he had the z down and the x and the y, and he had a little arrow around the direction of the turn, because you had to interpret this data that was on the screen. It was plus so many degrees. You had to know whether that's plus this direction or right or left and such.

It didn't take long for them to sort it out, and after about the third or fourth training session, they came in and they said, "All right, Hank, there ain't nothing we can't handle today." And by god, that's the way it was. They went through it, and it didn't make any difference what kind of contingents we threw in in terms of sensor failures or whatever it happened to be. Wenches could quit working. We could lower with less than the eight lines that were on it, and down it would go. That was pretty amazing.

Then when we were finally in the real operation—oh, we also had the simulation of when you put the piles in. Those piles they brought out were 650 feet long, weighed a million pounds each, and we had to up-end them and then send them down to the columns that they had to lower them into. There's a cowcatcher there, and you put it down. We had acoustics system and also a camera. So when you get them down there, you could lower it here, pick out the right height, bring it in, and then drop it down. They were 650 long. They'd run, as I recall, 135 feet into the mud, just under their own weight, and then they lowered the big pile driver on it.

TP: Yes, those underwater pile driver hammers.

HV: Yes, "tum, tum, tum, tum," and knock it right down to grade, something like four-hundred-and-some-odd feet into the ocean floor, and then they grouted around the pipe and the cone. It was most interesting. But when they finally set it down on the bottom, they lowered the two barges, and they decided they'd let out some more line and move them apart. But they didn't let out quite enough line at the time, so when they did that, the platform actually slid and pulled it sideways. Everybody had gone to lunch, and I'm sitting in there looking at the final results. I finally called back, I said, "The platform has moved on the bottom."

"No way. Impossible. That couldn't have happened." Well, they sent down an ROV, and sure enough.

TP: How much had it moved?

HV: It had rotated almost 5 degrees and moved only a few feet. It turns out it was 2 and a half degrees off in one direction from where they wanted, plus or minus 5 degrees they could set it on, and they moved across until it was 2 and a half degrees in the opposite direction. Back in those days, you didn't have GPS. You had to coordinate the data between the radio system they had on other platforms and the acoustic systems. When we finally got it all done, we did the calibration of the long baseline system on the ocean floor with the acoustics, and then coordinated at the time we made the measurements and took all the sample data. Each time we took a piece of data, we also got a range readings from these radio beacons. We got all done, we put them all together, and got the best fit between the data, and I said, "Okay. Here's where you actually set the platform, best that I know."

So it was about a year and a half later, when I got a call from Gordon Sterling. He said, "Hank, do you remember where we put that platform?"

I said, "Yes, I know where I thought we put it."

He said, "Well, where was it?" He gave me the coordinates. Back in those days, 25 miles off from the Louisiana coast. It was off 3 feet in one direction and 2 feet in the other direction.

TP: Let's stop one second here while I put in another tape. I want to follow up on that.

[interruption]

HV: It was off 3 feet in one direction and four in the other.

TP: But that's something they could live with, right?

HV: Well, it was 5 feet from where it was supposed to be. That was how much error there was between where we thought it was, based upon calibrating all the radio stations and acoustic station, and doing the best fit between the two sets of data. We were off by 5 feet; 4 in one direction, two in the other. That was pretty amazing back in those days.

TP: I'll bet you wish you had GPS.

HV: Oh, GPS now with the WAAS system, now you know where you are within a foot at all times.

TP: That's still pretty good, only off 3 feet, 2 feet.

HV: Oh, amazing to be able to—I was surprised it was really that close.

TP: Even with shifting once it got on—

HV: That shift was taken into account, and after we got all done, I said, "Okay, here is where it is."

TP: Oh, here's where you think it is, and—

HV: Yes. I said, "Here are the coordinates and here's the heading." When they finally got it up, totally up there and could actually make range measurements to the platform itself, and took data over a period of time, they said, "Well, this is where it actually is." And based upon the two different measurements [unclear], it was 5 feet. That was amazing back that early in the system.

Today, building a DP system is simple with redundant GPS, and the fact that the government has removed the selective availability that they had for all those years. That's one thing you have to thank Bill Clinton for. He removed the selective availability and set it to zero. Before, you had to have special codes that the military could put in. Otherwise, they just did their data. Before, the system was accurate only to 20, 30 feet, something like that, now it's much more accurate. And then if you use the differential, where they correct the ranges on the satellites in real time, you're basically a couple, 2 or 3 feet off. It's amazing.

TP: Slightly better than what you did, right?

HV: A lot better. That's real-time data, you know. Another place it was really interesting, where the technology and foresight really helped it was when we did the *Glomar Explorer*. We put down the six transponders, but you looked at four of them at the same time. Now you're in this 15,000, 16,000 feet of water. Well, because the speed of sound is 5,000 feet per second, so the time it took was like six seconds from the time that you sent it down until it comes back again. So your data is stale by that period of time.

Well, what you learned very quickly was that there's nothing in the range that gives you any additional data. It's the difference between this range and that range, so what you could do was you could send down an interrogation and then wait three seconds, send down another set of interrogation, where the responders down below would send back a second pulse.

So rather than processing ranges, we processed the difference in time between this transponder and that transponder, and that way, rather than having a six-second, we could go as high as three pulses in the water at the same time, which reduced the time period to two seconds. And with a two-second timing, every two seconds you got an update. Well, on a big ship like that, that was more than adequate.

And that system was so accurate that if you had nice weather and flat sea, you could look on the strip charts which showed the motion, and there would be the sine wave of the motion of the ship, making its motion plus or minus a couple of feet. And you looked at the time period, and it was exactly the control system frequency. This thing was accurate to like a half a foot of resolution in a deepwater operation.

TP: So the transponders are on the floor?

HV: They're on the ocean floor.

TP: The same for Cognac?

HV: Same with Cognac. They also had chart-based lined a single beacon on the bottom, which would send up signals, and then by a phase measurement on the ship, you could tell where you were. So if you were just going to sit there for a long period of time, you didn't have to interrogate the long baseline grid, because it had a finite light, whereas the beacon sent out a pulse every one second.

TP: How about lowering the other sections? Were there particular challenges in that compared to what you'd do in the base section? Was the main thing getting the base section set accurately?

HV: Yes. Get that one and get it anchored to the bottom, but then you also had to put in the piling that sealed it to the floor, drop that all in. And it came out that the second section, set that one on top, we had again the simulator, because we built a simulator as part of the trainer so that you could look and see the gauge when you put what we called a cowcatcher.

TP: The docking cones?

HV: No. On the docking cones for the piles there was kind of a gate on the front, like you see on a locomotive. That's why they called it the cowcatcher. And then you put the [unclear]. We also had the simulation so you could look at that. We could build a model of that, and then the computer would drive the pole, and then if you went the wrong—the simulator would show where you were, and then you take a look and make a decision whether to go down or up or right or left. You could put current on it. It would hang off to one side. So the simulation, again, for the training program, that plus the cones for the top sections, we had the two cones on each side, and when you finally got them lined up, you dropped them in.

TP: It wasn't that difficult.

HV: No. To me, the thing that was one of the exciting parts of that whole Cognac project was when you're working with these barge operators, one on each of the barges, that basically controlled all the people that ran these derrick barges, and we had put on the front of the barges these control stations where it would show the line out to all the anchors. Well, we knew about where the anchors were, so we had a program which would tell you if you wanted to move, how far you could move. You'd put that into the program and it would tell you how much line you had to put in and out. But they would not tell their people how far. They'd tell them,

"Okay, let out line until I tell you to stop." It was the old way of burn [unclear] barges.

Well, we finally took one of the superintendents and I told him, "Well, the way this thing is designed to work is, we run the computer program, we give you this list of the new line outs. Call that in to your four stations of operation, two on each barge, and let them run the line in and out." Well, they didn't think that these people running the angle were smart enough to do that. Well, I said, "Yes, they could read that. Give them the new line, they know whether they got to pull in or pull out."

Well, the one guy finally decided that he would try it. Well, he tried it and it worked. I can still remember when he came in and put the base section down after we had gone all around with the system to do our calibrations and all, and this one superintendent tried it, and we told him how far he had to move, and it all worked. Well, when they finally got ready to put the second section on, lifted it up and brought it over, we ran the program —because they always upended it way off to the side, so in case it dropped, it wouldn't destroy the base section. Well, this first time that they tried that, we ran the computer program and I said, "You got to go a hundred and some-odd feet in one direction, and twenty feet in the other, and a couple of degrees of rotation." So we put that in the computer program, and it come out and gave them these numbers, and they ran it."

TP: For the lines, right?

HV: For the twelve lines—

TP: —that were attached to the sections. They had to bring them in or out.

HV: Yes, they were anchored. There were two going this way, two going that way, two going forward, two going back, and then forward at 45 degrees, and they ran that thing and in one hit, in one time, they were within 3 feet. When they got ready, they moved it 104 feet. That system was so accurate that it actually moved the barge almost precisely the 104 feet that it was supposed to go. And then the next movement, it was so close it looked like it was like a foot or so. I can still remember Gordon Sterling says to me, "Well, Hank, do you think you can get it any closer than that?"

I said, "I don't think you need to."

He said, "Drop those two poles and put them down." And that was it.

And when we left the barge, okay, there was one superintendent—I wish I could remember his name. He came up to me and he shook my hand, and

he said, "You know, Hank, I don't think I'll ever be able to run an ordinary barge again." [laughs] He was so impressed with the technology that he had for moving the barge and handling it, because it was just incredible.

We had the same experience on the *Glomar Explorer* when we had to take and put the barge over top of this big submersible thing they sank on the bottom, open the doors, and they could reach in with these two big poles and pick up the machine. They called it Clementine. The captain would then tell them how to pull the lines. We finally got all done and I said, "Captain, I got the whole program on my little HP55," one of those little HP systems. I'd programmed it in that little thing to calculate how much line had to be on these four lines. And I said, "I got this program that can tell you how much you have going."

He said, "Well, okay, run your program."

So I ran the program and told him how much. I can remember, it was like 14 feet on this one, 23 feet on that one, and he says, "Well, I'll just do half of it."

"Okay." So he does half, and gets done. I went down and looked at the two taut wires that they had down there, and made some more calculations. I said, "Well, Captain, you did pretty good. You're halfway there." So I gave him the next set of numbers, and I can still remember, because you had to count in the number of links, and it was 4.7 links, and .3 links. He looked at me and he said, "Nobody has ever pulled .3 link."

And I said, "No. Nobody has ever tried to move a big barge within a few inches of where you got to go." And so we ran it, and those two taut wires were absolutely perfectly vertical.

It was about a year later that we went back out there, about a year after sea trials, and we were ready to do it again. After the sea trial, they made all the modifications, and I can still remember sitting in the staff meeting. They were going around, and everybody was ready to go and asked the captain, "Captain, are you ready to pull the anchor lines?"

And he turned around, and he said, "Hank, did you bring your program?"

I said, "Yes."

He said, "We're ready." [laughs].

TP: You won some converts among your barge captains.

HV: That was really probably one of the more fun things that we did. Probably the most humorous thing that happened to me in the whole entire offshore industry was when we went to Japan, to Tamano. Because I was raised in Oregon on a farm, way out in the back county, I was always deer hunting and stuff, so I was always wearing a red felt hat. So when I went to Tamano, this was before you had to wear hardhats all the time when you were on the ship, and I was wearing this old red felt hat. We'd come into the control system, I'd take my hat off and I'd set it down. I'd turn around and look and my hat would be gone. And you'd look around and wander around the bottom of the ship, and everywhere you looked, one of the Japanese workers would have my red hat on.

TP: Were they just playing a joke?

HV: No, they just thought this was the most fascinating thing they'd ever seen, a red hat. So these guys were always borrowing my red hat, and you'd see it in all different places, but every evening when it come time to go, there would be my red hat again. [laughs]

TP: Everyone wanted a turn wearing it.

HV: Everybody wanted to have a turn wearing this old red felt hat.

TP: You could keep track of where it was.

HV: You'd look down on the rig floor or look down, and wherever it was you happened to be, there'd be my red hat.

TP: This is a great story about the Cognac. You mentioned, before we started talking, that you also worked on the Lena?

HV: Right, the Lena tower.

TP: And that was about the same time?

HV: That was two, three years later, I would guess. That was the guide tower with twenty guidelines, and the bicycle chain kind of thing that you had to lower. We, again, built a simulator for that one so they could do some practice on operating the DP, and that's the one where they had the big Brown & Root barge. It was 141 feet by 409 feet long. *Big Bird* was the name of it.

TP: The launch barge?

HV: Launch barge, great big derrick barge. And I'm standing on it one day and I'm calculating how high this thing is, and this barge is big enough that it could lift a million pounds 300 feet in the air. I mean, that's how big this thing was, huge derrick barge. And I can still remember, I was standing there looking at that thing, doing some calculations, and I said, "My gosh, if a goose flew by at half the height of the ground wire on the derrick, he'd be out of range." [laughs] That's how tall that thing was. It was amazing.

Then we got into a very bad sea condition that came up very fast, and they couldn't get a tug onto the barge. We sat there on that barge. The barge was in a sea state of 5, 6, 8, 15, 20-foot seas out there. That big old barge was just going up and down.

TP: This was before they launched the platform?

HV: Yes, this was during the pre-installation. That was a DP barge. We dynamically positioned that barge. And I looked at that wave, and that barge was sitting there like that into the waves, and the way we were loaded in those seas, if that thing ever had turned broadside, that would have been it. That thing would not have stayed vertical. It would have rolled over and died.

TP: And you were on it at the time?

HV: Oh yes. I can remember my good friend Mike Dudeff [phonetic], who had worked with the DP system. We kind of looked at each other and he said, "You know, that DP system better work all night, because if not, we won't be here in the morning."

Sure enough, it ran, and the wind was so strong that during the time that we were on station, that barge was moved back something on the order of 5 miles. The wind was so strong that running those four big steerable thrusters full bore as fast as they could go, facing into that 45-mile-an-hour wind, which never stopped for three days; the barge was blown off for 5 miles. Then finally the wind died down and the barge went back to where it was supposed to be. That was probably one of the scariest moments in the entire [unclear].

TP: DP barges, was that very common?

HV: No, it's the only barge I've ever known that was a DP Brown & Root barge, with four big thrusters on there, and built a DP system, and it had a special house.

TP: Was it just temporary for that Lena project? Did they take them off after that?

HV: I don't know if they used it afterwards or not. I had no contact with Brown & Root after the Lena project.

TP: And so you were contracted with Brown & Root, not with Exxon, for the Lena project, is that right? You worked with Brown & Root.

HV: It was a Brown & Root barge, so our contract was with Exxon. That was really the main difference between working for Exxon and working for Shell. When you worked for Shell, they treated you as if you were a Shell employee. I mean, you were part of the team. Everybody from Shell was always on the barge, all the decisions were made on the barge, and you were treated like a Shell employee. And they got 150 percent work out of you just because of the camaraderie that you got with working with Shell.

When you worked for Exxon, they had one engineer on the barge who was the engineer on site. He relayed all the information to the beach, and all the decisions were made on the beach. When you worked for Exxon, you were a subcontractor, and you better damn well remember that you're nothing but a subcontractor. That was the difference between the camaraderie that you get working with a group where you were part of the organization versus someone you got to put up with. It was kind of like the difference between working for private operation and working for the government. It was really quite an eye-opener to see the difference in the management philosophy. I don't know if things are any different today.

TP: Do you think they were both exceptional or one was exceptional? Were other companies more like Shell or more like Exxon, or is it hard really to generalize it?

HV: Shell stood out by itself, absolutely head and shoulders above the rest of the industry as far as I could tell, at least with my experience. I worked for Mobil, Exxon, and I also did the Mobil flow line project offshore. Working for Shell was a pure delight, absolutely.

TP: Shell U.S.A., anyway, or Shell Oil.

HV: Shell Oil. It's a group out of Louisiana. They were an absolutely amazing group. Camaraderie and what you had with the people was absolutely fantastic.

TP: They were clearly heads and shoulders above everyone offshore, the technology, depth, and commitment to the Gulf of Mexico.

HV: Yes. You saw that also in your studies.

TP: I've heard it many times. You're not the first person I've heard that from. And I'm partial, too, because I interviewed all the Shell guys and wrote a book on Shell, and that's one of the themes in the book. But I'm interested when people draw these comparisons, because enough people say that there's confirmation in what other people are saying.

HV: Well, a couple of the most amazing people that I've had the privilege of working with—well, several of them. Howard Shatto, for one. An amazing man. Talk about integrity and intelligence, and just one of the princes of the company.

TP: Some year the OEC is going to stop honoring him. He's been inducted in several categories. The MOBOT, dynamic positioning, and all sorts of things.

HV: He's an amazing man. Dillard Hammett is another one of those guys that just—talk about a guy that can get things done. He hated salesman, but loved the engineers that worked with him. The decisions were always made. The salespeople, he had not much use for those, but he sure was wonderful working with. And then, of course, that whole Shell group of Gordon Sterling and such.

TP: The Central Engineering Group.

HV: Yes, that was a delightful bunch to work with.

TP: So you stayed with Honeywell through this whole period, through the seventies?

HV: I came in '68 when I moved from TRW Systems, and stayed with Honeywell all the way through until I retired when I was fifty-eight in 1992. Never had a dull day in my entire engineering career. Pretty much everything we did, it was the first time it'd been done.

TP: So did you continue working with offshore systems?

HV: Well, mostly subsea. After the Lena project, then most of the work that I did was with the government, the navy and the—

TP: Just sort of navigation?

HV: No, I did everything. I built all kinds of different ROVs, I built just about anything you could imagine; laser work, underwater cable, cable laying, special projects.

TP: Did you worked ROVs for the offshore industry or mainly just naval applications?

HV: No, it was based in naval applications. Going on the last fifteen years, most of my work was with the government in the subsea world. They had lots of problems to be solved.

TP: I guess you had that experience going back to the ballistic missiles and the Jennifer project.

HV: Yes, that was pretty exciting. I got to run the operation on the Jennifer project; trained the crew and actually ran the control center during the time. I knew every wire, every valve, and everything you could possibly think of.

One of the most interesting things on the HGE [unclear] is, they had alignment cameras. You know, they had pictures, they'd put it all together, so you can know exactly where how you wanted to set the machine down. And there was a crosshair like this, and one of the cameras in the front and one in the back, and one goes right intersection of the sail and another bar outside, and we got down there and we got the thing pretty well aligned. And I looked on that screen and here lays a ball-peen hammer. This ball-peen hammer was exactly where the crosshairs were, and here's this ball-peen hammer laying there.

TP: On the bottom of the ocean?

HV: Yes, right on the submarine. And here lays this ball-peen hammer. I said to my good friend Irwin, "I don't remember seeing this."

He said, "Well, let me go get the book." So he brings the book, and here are all the pictures of the target object, and there was no ball-peen hammer there. During the time we sat over the top, somebody dropped a ball-peen hammer through the moon pool, and it fell 16,000 feet and landed exactly on the crosshairs. Unbelievable. Absolutely unbelievable.

TP: I'd love to talk with you longer about some of this stuff, especially the Cognac, but it might be a good place to stop. I'll let you go and get ready for this evening. I appreciate your time. Thank you.

[End of interview]